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ABSTRACT

This guide is designed for adult volunteer leaders, camp counselors, and teachers who want to explore the subject of recycling with youth. An introduction explores the waste disposal options of reducing, reusing, and recycling, and reasons for recycling. Additional background information is provided on common solid waste and how it can be reused and recycled. Each of 11 activities includes some or all of the following: an introduction, student objectives, materials needed, activity procedure, follow-up questions, and reproducible student worksheets. Students organize a school waste-reduction project, research local community waste issues, learn facts about waste disposal, expand waste-related vocabulary, become aware of resources used in everyday life, build a terrarium, grow plants from garbage, and build an indoor worm composting system. Additional sections contain: (1) information on reducing, reusing, and recycling in the home; (2) information on careers related to solid waste; (3) a 25-word glossary; and (4) a list of 31 additional 4-H natural resources publications. (LZ)

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ED 377 027

EXPERIENCE

4-H NATURAL RESOURCES

Recycling:

Mining Resources From Trash

Jean F. Bonhotal

U.S. DEPARTMENT OF EDUCATION
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4-H Leader's/Teacher's Guide

A Cornell Cooperative Extension Publication

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Posters

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- Watching Your Waistline

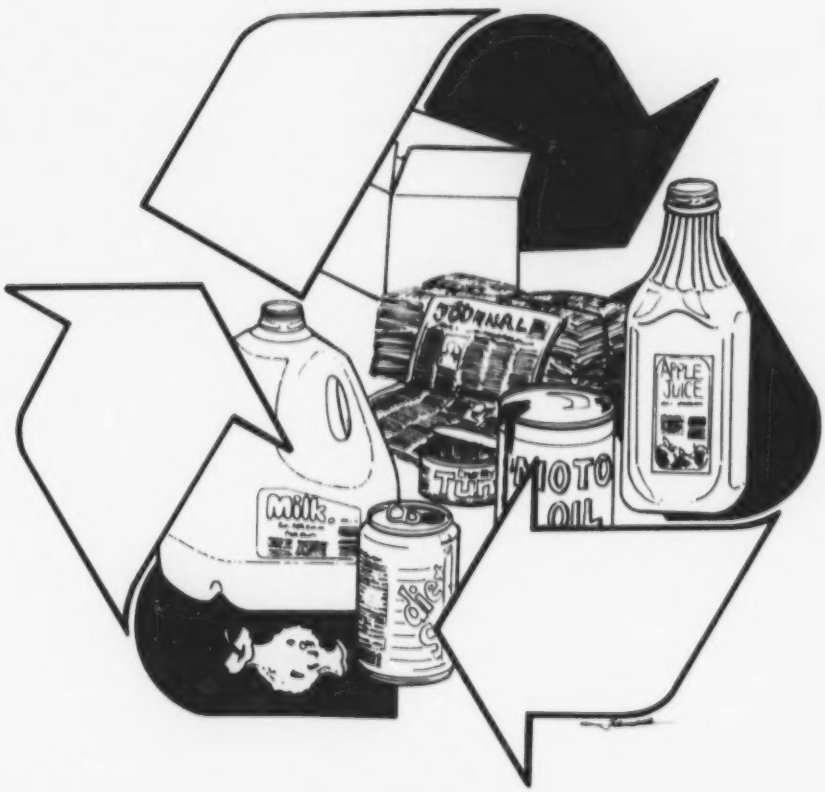
EXPERIENCE

4-HNATURALRESOURCES

Recycling:

Mining Resources From Trash

Jean F. Bonhotal



4-H Leader's/Teacher's Guide

A Cornell Cooperative Extension Publication

Printed on recycled paper

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Jean F. Bonhotal is an extension support specialist for the Cornell Waste Management Institute.

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Cornell Cooperative Extension

Helping You Put Knowledge to Work

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Recycling:
Mining Resources From Trash

Waste Disposal Overview

Just as we mine precious metals such as gold, silver, and copper, we can also mine garbage. Our trash contains many precious resources that can be separated out to be **Recycled**. Paper, glass, metal, plastic, organic waste, motor oil, and much more can be refined and made into new products.

The Three R's of Waste Disposal

Reduce

The first step in reducing garbage is to produce less. When shopping, we should buy items with the least packaging, choose products that can be reused and avoid buying disposable items.

Reuse

Before disposing of or recycling items make sure they have been reused as much as possible. For example, instead of buying new plastic containers for leftovers, wash and reuse old plastic containers or jars.

Recycle

Many communities in the United States have recycling programs. Join the rest of the country and participate in your recycling program.

Note: Each town, county, and state has a recycling plan tailored to its needs. Before placing items on the curb to be picked up or leaving things at drop-off centers, find out which items your community is recycling.

Why Recycle?

(1) Recycling saves resources — The United States is fortunate to have abundant natural resources, but if they are overused and mismanaged, we will run out. Natural resources are either *renewable or nonrenewable*.

Examples include:

Renewable	***Nonrenewable*** *(in our lifetime)*
Trees	Iron, tin
Plants	Minerals
Animals	
Soil *(very slow process)*	Petroleum products
Fibers	Coal
Rubber *(very slow process)*	Bauxite needed for aluminum

(2) Recycling saves space in landfills — Since landfills are closing and space in existing landfills is limited, we must conserve space for garbage that cannot go any place else. Things that cannot be reused, recycled, or burned will need to be put in landfills.

(3) Recycling saves energy — Less energy is required in the overall process of recycling than in using raw materials that must be mined.

Recyclable products	***% of Energy Saved When Recycled***
Aluminum	80-95%
Glass	8-14%
Newsprint and cardboard	50-70%
Plastic	85-90%

What's in Your Trash Can, Where Should It Go, and What is Made Of Recyclable Materials?

Let's open up the trash bag to explore where our garbage should go and what a valuable resource it can be. We will investigate how we can reduce the amount of trash we produce, recycle, compost when we can, and effectively dispose of what is left.

The most common items that are being recycled are paper, glass, metal, plastic, organic waste, and motor oil.

Let us look at these recyclable items one by one.

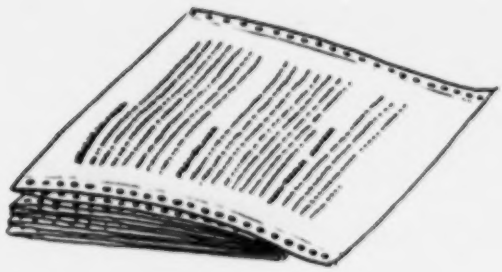
A. Paper

Newspaper:

Reduce: Share with others, only subscribe to newspapers you really read.

Reuse: Use for messy projects, animal bedding, paper training animals, washing windows, packing materials, fire starting.

Recycle: Place dry newspaper in paper bags. Do not use plastic bags unless requested by your town. Place newspaper at the curb if curbside pickup is available, or take them to a drop-off center.

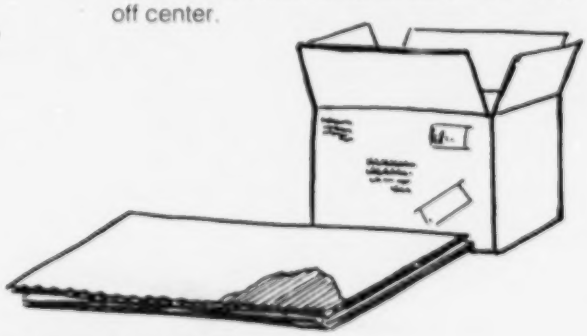


Office and computer paper:

Reduce: Share copies with others.

Reuse: Use for scrap paper, drawing paper for children, craft projects, backs of papers in computers and copy machines.

Recycle: Make sure each classroom and office has enough boxes to make recycling easy for participants. Place labeled boxes next to waste baskets, copy machines, and computers. When the boxes are full, arrange to have them picked up or taken to a drop-off center.



Corrugated cardboard:

Reduce: Avoid excess packaging.

Reuse: Use for storage (boxes), use as a drop cloth for painting, working on cars, or for craft projects.

Recycle: Flatten and bundle cardboard with strings or baler. This is common practice in businesses and stores where much of the waste is boxes.

Magazines and Glossy advertisements:

Reduce: Encourage stores to put ads on regular paper. Read magazines at the library or share with friends. Only subscribe to magazines that you really read.

Reuse: Donate magazines to nursing homes, hospitals, libraries, and doctors offices. Use for craft and school projects.

Recycle: This is done on a limited basis.

Junk mail:

Reduce: Try to get taken off mailing list by writing: Direct Marketing Association, Mail Preference Service, 11 West 42nd Street, P.O. Box 3861, New York, NY 10163-3861, for assistance.

Reuse: Pass on items of interest.

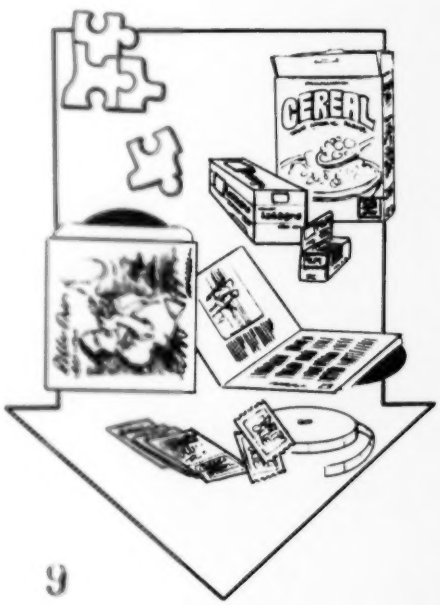
Recycle: Envelopes (remove shiny window first) and nonglossy inserts can be recycled as office paper.

What is made from recycled paper?

It may be used to make:

- game boards
- record jackets
- egg cartons
- grocery store food boxes
- book covers
- gift boxes
- jigsaw puzzles
- game and show tickets
- cereal boxes

Buy Recycled Products



B. Glass:

Common types include: green, clear, and amber.

Options:

Reuse: Use to store leftovers, candy, buttons, nails, and bulk items bought from stores. Jars made specifically for canning should be used over and over again.

Recycle: Note that plate glass, light bulbs, drinking glasses, and ceramics cannot be recycled. If bottles have a deposit, they can be returned to stores for a refund. Check with your community to see if glass should be separated by color or mixed together, then either place on curb or deliver to drop-off center. If required, rinse bottle, and remove caps and bottle rings.

What is made from recycled glass?

It may be used for:

new bottles

asphalt used in street paving

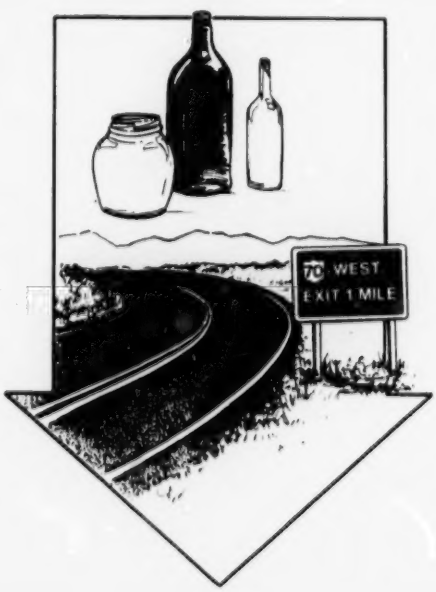
brick

tile

reflective paint for highway signs

fiber glass insulation

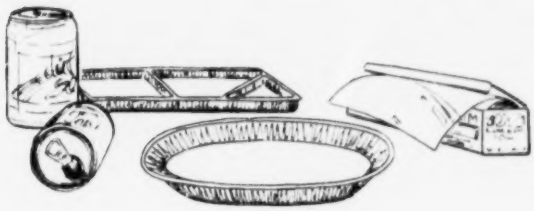
Buy Recycled Products



C. Metal

Aluminum:

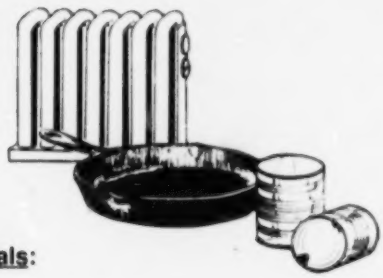
Common types include food containers, cans, lawn chairs, car parts, window frames, aluminum foil, storm doors, and gutters.



Reduce: Buy durable items instead of disposable products.

Reuse: Many items can be cleaned and reused (e.g. baking pans).

Recycle: If cans have a deposit, return them to stores for a refund. Participate in your community's program. If your community recycles aluminum, place it on the curb or take it to a drop-off center. If aluminum is not recycled, scrap metal dealers in most areas will buy or take it. Make sure the material is clean.



Other Metals:

Metals are either *ferrous*, which means they have magnetic properties and will stick to a magnet, or *nonferrous*, meaning they do not have magnetic properties.

Common ferrous metal include cast iron, steel, sheet metal, tin-coated cans, and bi-metal cans. Nonferrous metals include aluminum, nickel, bronze, copper, brass, and lead.

Reduce: Buy durable items instead of disposable products. Repair items rather than disposing of them.

Reuse: Use cans to store household items, have car parts rebuilt, use old pots for planters.

Recycle: All types of ferrous and nonferrous metals can be recycled, but they may need to be separated. Some metals that are not collected in community programs can be sold to scrap metal dealers.

What is made from recycled metal?

Most metal objects can be remade.

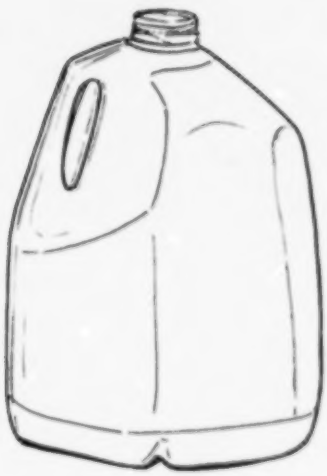
Examples include:

- cans
- lawn chairs
- window frames
- printing plates
- car parts
- pots
- airplanes

Buy Recycled Products

D. Plastic

Common types include product packaging, bags, tools and utensils, toys, bottles, and car parts.



Options:

Reduce: Avoid all types of disposable items.

Reuse: Use for craft projects, storage, water jugs, boat bailer.

Recycle: There are many different kinds of plastics which may need to be separated. Rinse bottles and place material on the curb or take it to a to drop-off center.

What is made from recycled plastic?

It may be used to make:

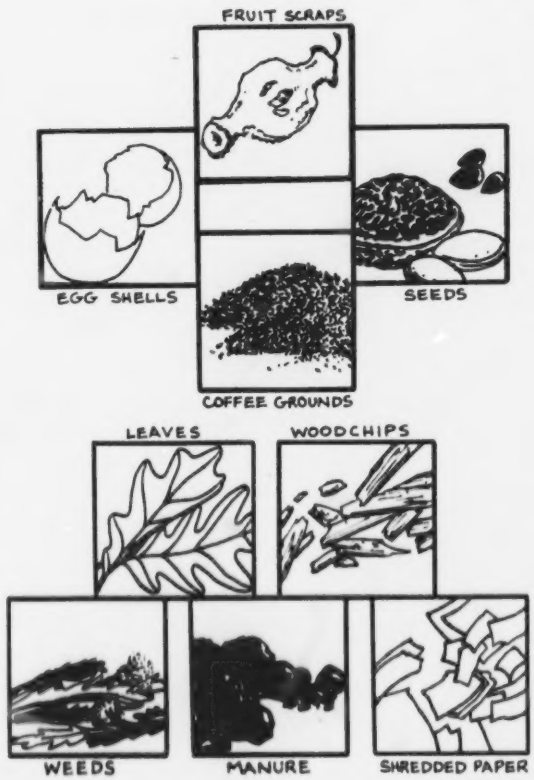
- fiber filling for pillows
- ski jackets
- cushions
- sleeping bags
- paint brushes
- appliance handles and cases
- textiles and fibers
- non-food containers
- plastic
- building material
- sinks
- boat hulls
- flower pots

Buy Recycled Products

E. Organic Waste

Types include fruit and vegetable wastes, leaves, and grass clippings.

Recycle: Add to compost heap, mulch with leaves and woodchips, use to feed animals. If possible, home composting household and yard waste is the best method. This is nature's way of recycling. You can compost kitchen and yard wastes together or separately. (Consult your local Cornell Cooperative Extension office for more information on composting.) Communities may have municipal composting sites. Local rules may require leaves and yard wastes to be deposited at the curb (but not in the street) or to be placed in bags.

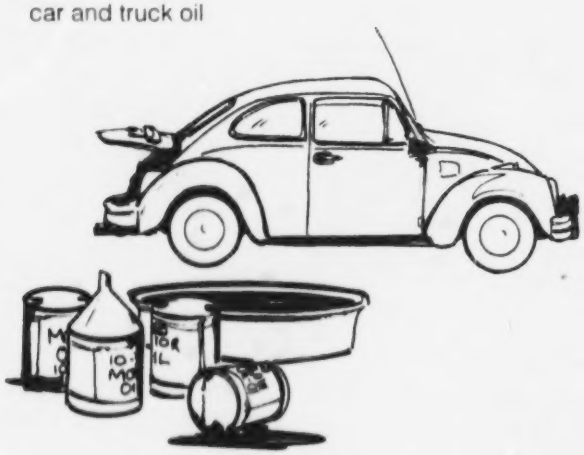


What is made from recycled / composted organic material?

Compost adds nutrients to soils, increases water retention in soils, and becomes mulch to protect plants in harsh weather.

F. Motor Oil:

car and truck oil



Reduce: Use oil wisely by insuring that engines are well maintained to use only what they need.

Recycle: Oil can be refined to be reused in motor vehicles. Any service station that changes oil will have an oil collection tank. A New York State law requires that such stations take your used oil unless their tanks are full.

Note: Motor oil contaminated by antifreeze cannot be recycled.

What happens to recycled motor oil?

It can be cleaned and used in car and truck engines and in specially designed oil-burning heaters.

Activities

A. Field Trips

Background:

Because waste disposal is a complex task, it will take a combination of disposal methods to solve a community problem. By touring a facility, youth will gain a better understanding of the options.

Objectives:

To observe waste disposal options.

Procedure:

The following field trips can be taken to explore firsthand how garbage is handled. Always call ahead and organize a tour. It would be beneficial to discuss solid waste management before visiting a facility. Refer to the end of this publication for a list of other materials available to assist you.

1. Recycling plant. Aluminum, glass, paper, papermill, and cardboard can be recycled at a recycling plant.

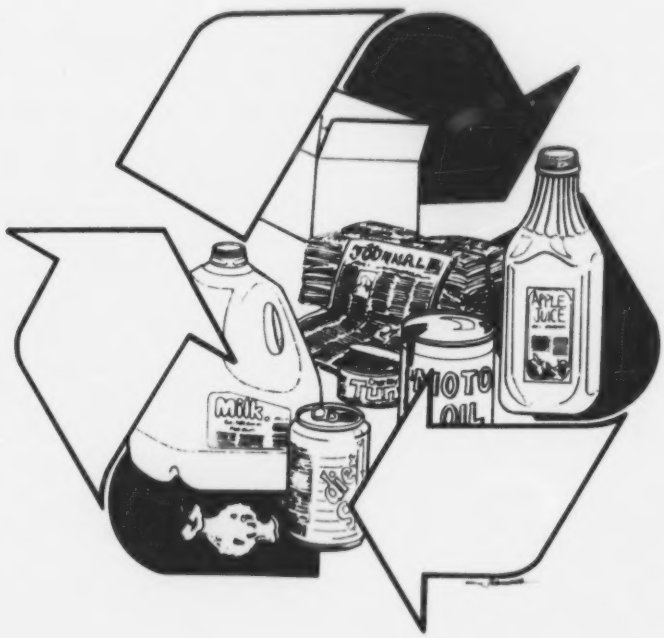
2. Composting site. Some community's have compost made from leaves, yard waste, or sludge. Also visit a backyard compost. If you don't have one yet, most gardeners do. Ask the local garden club or Cooperative Extension to assist you.

3. Material recovery facility. This is a warehouse that collects, sorts and sells recyclables to recycling companies.

4. Landfill.

5. Incinerator.

6. Paper Mill.



Field Trip Record

Write a story about the trip you took. You may want to write it for a school newspaper, class report, or speech. The following questions will help you to get organized.

Remember to cover all the questions a good journalist would cover.

Who went?

What did you learn? Interesting parts, boring parts.

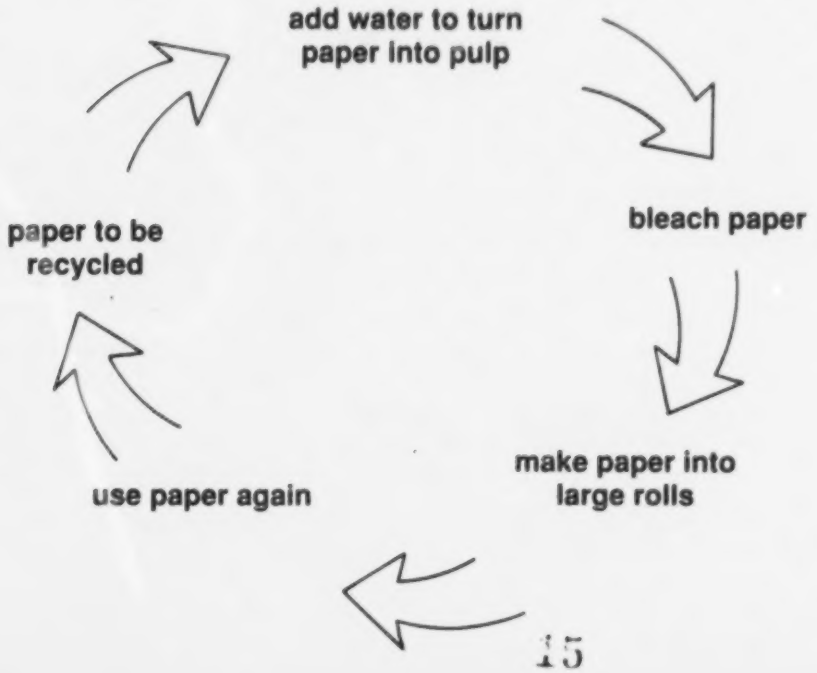
When did you go?

Where did you visit?

Why did you go and why was it interesting?

How does this facility fit into the communities solid waste plan?

Further exploration: draw a diagram of the places you visited; i.e. paper recycling plant.



B. Investigate Your Community

Background:

In this exercise students will collect data on recycling and solid waste in the local community. To get this information, it may necessary to contact the recycling coordinator, county government (department of public works), and other educators in your county.

Objective:

To practice research skills and gain access to information in your local community.

Materials:

- Pen
- Paper
- Telephone
- Brochures on topic (if available).

Procedure:

Find answers to the following questions.

1. What is the population in your county? _____

2. How many townships or municipalities are there? _____

3. How much garbage is produced? In school, town, county?

_____ per day

_____ per month

_____ per year

[While the national average is 3.5 pounds per day, New York State residents produce about six pounds per day.]

4. Who is responsible for collecting and disposing of trash? _____

_____

5. How is garbage disposed of? Possibilities include landfilling, recycling, incinerating, composting, and shipping it to other places. _____

_____

6. How much does it cost to collect, transport and dispose of waste per ton? This may include:

(a) tipping fees (cost per ton to dispose of garbage at the landfill or resource recovery plant).

(b) cost per household if using a public or private hauler, including collection and transportation.

(c) cost per ton if your county ships garbage to a location outside the county.

7. Is there a recycling program in your area? Yes / No

Is it run by a public or private organization? _____

How can citizens participate in the program? _____

_____

_____

What types of resources are being recycled? _____

_____

_____

8. Compile this information into a fact sheet. Write articles for the school or local newspaper, or share it in any way possible with your school, family, community, church, and civic groups. Do a slide show.

9. You may want to complete this exercise once or twice a year to record the changes that have occurred.

C. Trace Your Waste

Background:

Youth can explore their community by finding out what is done with the waste they produce, e.g. trash and sewage waste.

Objective:

To make students aware of where their own waste ends up and realize that this has an impact on the quality of our lives.

Materials:

- Map of town or county
- Paper
- Pencil
- Telephone
- Resource people:
  - county government
  - board of supervisors
  - recycling coordinator
  - department of public works
  - county planners

Places to Investigate

- Landfill
- Incineration plant
- Recycling facility
- Compost
- Other waste disposal facility

Procedure:

1. Identify all the waste disposal options in your community.

2. Mark them on your map.

3. Decide where each type of waste can go. Each item may have several options.

4. Optional: Use the information you gathered to write a report on waste disposal or create a bulletin board or exhibit.

D. Trash Trivia Game

Background:

In the previous exercises, you have seen the immediate effects you can have on decreasing the waste stream by reducing, reusing, recycling, and composting. In this activity, you will learn new facts about recycling and solid waste disposal. You can also review some of the information you have learned in other activities in this project.

Objectives:

To learn facts and figures about solid waste.

Materials:

- Game cards (photocopy cards if more are needed)
- Timer
- Score sheets
- Pencil or pen

Procedure:

1. Divide into two to four teams of three or four members.

2. A member from one team picks a card and reads the question and answers. That team has 30 seconds to answer the trivia question.

3. If team members answer correctly, they take another turn. If not, the other team takes a turn.

4. A team gets one point for each correct answer.

Score Sheet

Team 1	*Team 2*	*Team 3*	*Team 4*

Note: Team scores 1 point for each correct answer.

Trash Trivia Cards

What country has 6% of the world's population and produces half of the world's garbage?

A. The Soviet Union

B. China

C. The United States

How many trees must be cut to provide paper for one Sunday edition of the New York Times?

A. 62

B. 628

C. 62,860

How many trees are saved when one ton of paper is recycled?

A. 5

B. 17

C. 100

How many tons of dangerous waste are produced by American industries each year?

A. 3 thousand tons

B. 1 million tons

C. 250 million tons

What percentage of landfills in the United States were closed between 1984 and 1988?

A. 30%

B. 5%

C. 50%

What is New York's largest export out of the Port of N.Y.?

A. food

B. waste paper

C. shoes

How many pounds of glass does each person in the United States use each year?

A. 100 pounds

B. 10 pounds

C. 50 pounds

How much of Japan's waste stream was recycled in one very effective program?

A. 30%

B. 50%

C. 80%

How much of our waste in the USA goes to landfills?

A. 25%

B. 50%

C. 80%

How many tons of solid waste does New York State produce in one day?

A. 270 tons per day

B. 2700 tons per day

C. 27,000 tons per day

When you buy $11.00 of groceries, how much of that money pays for the product packaging?

A. 10 cents

B. $1.00

C. $5.00

Where should household hazardous waste be disposed?

A. local incinerator

B. landfill

C. buy only items you need and use as directed.

What percentage of our garbage is plant matter and can be composted?

A. 20%

B. 80%

C. 3%

Name something that is made from recycled glass. ***(Don't read answers)***

Bottles, bricks, construction materials, road-building materials, fiber glass insulation

By what year should all communities in New York State have started recycling programs?

A. 1980

B. 1992

C. 2000

In how many weeks is the average aluminum can remelted and back on the supermarket shelves?

A. 2 weeks

B. 30 weeks

C. 6 weeks

Why should you recycle your glass and metal drink containers?

A. saves energy

B. helps do your part

C. both A & B.

Is less energy used to produce aluminum cans from recycled aluminum than from ore?

A. Both ways use the same amount of energy.

B. Recycling uses more energy than mining ore.

C. 90-95% less energy is used when aluminum cans are recycled.

How much do you pay for packaging when you buy a product?

A. Up to half of the total cost

B. 75% of the total cost

C. 3% of the total cost

How many tons of solid waste does the world currently produce each year?

A. 7 tons per year

B. 1000 tons per year

C. 1/2-1 billion tons per year

What percentage of trash is due to discarded packaging wastes?

A. 70%

B. 30-40%

C. 5%

Is less energy used to make new paper from old paper or from freshly cut trees?

A. Paper made from trees uses less energy than recycled paper.

B. There is no difference.

C. Recycling paper uses about one-third to one-half of the energy needed to produce paper from trees.

Which creates more pollution: making paper from trees or recycling paper?

A. Recycling paper produces less air pollution and saves energy.

B. More air pollution is produced by recycling.

C. Both ways create the same amount of pollution.

How many pounds of solid waste per person in the United States are put in landfills each year?

A. 2000 pounds per person per year

B. 100 pounds per person per year

C.500 pounds per person per year

Each year, how many tons of paper does the U.S. throw away that could be recycled?

A. 40 million tons per year

B. 1 million tons per year

C. 1 billion tons per year

Name two items found in your household that may be hazardous? *(Don't read answers)*

Bleach, solvents, cleaners, batteries, pesticides, medicine, paint, automotive products.

In a landfill in the northeastern United States, how many years are required for an aluminum can to break down?

A. more than 200 years

B. 10-30 years

C. 100 years

Name an item that could be reused but is normally thrown away. *(Don't read answer)*

yogurt container, styrofoam package, plastic bag, rubber tire, coffee can, glass bottle

When you go shopping what can you do to help solve the garbage problem? *(Don't read answers)*

avoid disposables, buy things that can be recycled, buy products made from recycled materials, avoid excess packaging

If you buy a can of soda pop, what should you do with the can after you have finished the soda?

A. Crumple it up and throw it on the ground. It will rot in a while.

B. Throw it in a trash can with other paper wrappers and garbage.

C. Put it with other cans to be recycled, or return it for a 5¢ deposit.

Which item will break down faster?

A. Apple

B. Aluminum can

C. Plastic jug

What two things should you keep out of your compost?

A. apple cores

B. eggshells

C. aluminum cans

D. meat scraps

From what natural resource is new paper made?

A. grass

B. trees

C. stones

Why shouldn't we dump our wastes in the ocean?

A. Garbage will break down faster if it is put in a landfill.

B. Waste pollutes the ocean and harms animals and plants that live there.

C. It makes tidal waves.

What animal is not supposed to be in your compost pile?

A. a worm

B. a mouse

C. a spider

What can you do with the compost you make from your kitchen and yard wastes?

A. Send it to the landfill.

B. Use it to enrich the soil in your garden.

C. Feed it to your dog.

Where is compost naturally found?

A. in the air

B. in the soil

C. under your bed

If we recycled the aluminum trash that Americans throw away every three months, we could:

A. rebuild the entire U.S. airline fleet

B. save a lot of energy

C. conserve valuable resourc

Note: all answers are correct

E. Mix and Match Waste Game

1. Compost pile	A. When natural materials break down and become soil.
2. Conservation	B. Dirty.
3. Decomposition	C. A place to put vegetable peels, leaves, and grass clippings where they will decompose to humus.
4. Environment	D. Chemicals and some industrial and domestic wastes that are harmful to all living things.
5. Leachate	E. Wise use of our natural resources to avoid waste.
6. Natural resources	F. The dirty water that collects after rain runs through a landfill.
7. Polluted	G. A landfill where toxic wastes are stored.
8. Recycling	H. Things we depend on in our environment that are supplied by nature such as air, water, soil, and wildlife.
9. Reuse	I. A place where garbage is properly buried to protect water and the surrounding environment.
10. Sanitary landfill	J. The natural world around us.
11. Secure landfill	K. The collection and reprocessing of manufactured materials for reuse either in the same item or as part of a different product.
12. Toxic waste	L. Using items more than one time, e.g. peanut butter jars for buttons or nails.
13. Waste wise	M. Using our heads about conserving, recycling, and any problems we might have dealing with solid waste.
14. Solid waste	N. Everything we throw away, e.g. glass, metal, plastic, and kitchen scraps.

Ans: 1-C, 2-E, 3-A, 4-J, 5-F, 6-H, 7-B, 8-K, 9-L, 10-I, 11-G, 12-D, 13-M, 14-N

F. Create a Landfill or Compost

Objectives:

To observe the different aspects of decomposition in mixed garbage in a landfill and organic material in a compost.

Background:

Decomposition occurs everywhere naturally. Since we generate so much garbage we need to observe how and whether it decomposes in different situations. In this exercise, you can find out how fast items such as paper, metal, organic material, and other items break down or not.

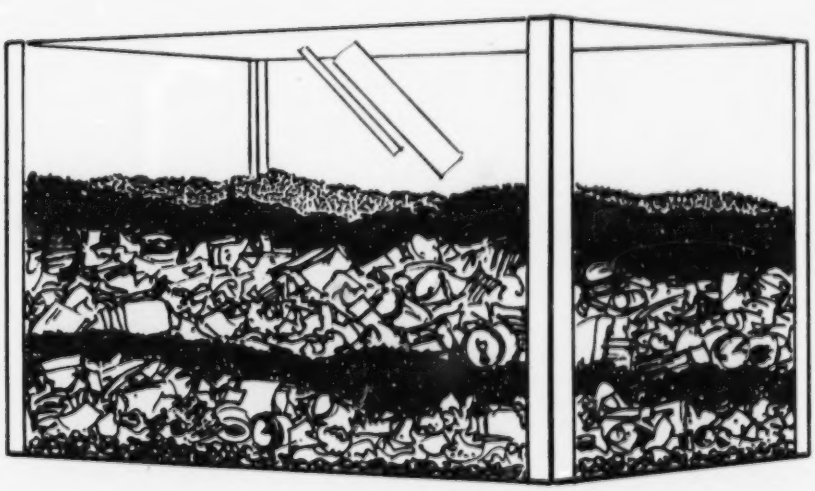
Materials:

- Clear plastic or glass container (you can use the bottom of a two or three-liter soda bottle with the base removed)
- Ordinary garden soil (do not use sterile potting soil; it contains no microorganisms)
- Various types of waste: food (banana peels, bread), paper, metal (aluminum foil), plastic (styrofoam, bags), leaves, wood, steel can
- Newspaper to cover desks
- Large spoons or trowels
- Scissors

Time:

30 minutes to complete landfills

A few minutes a week to check on decomposition for as long as you care to observe it



Procedure:

Divide up into groups of two to four, depending on the number of containers.

1. Get waste from the bags that have been collected.

2. Cut up waste into pieces approximately 2" square.

3. Put waste into the container against the edges so that it can be seen when the soil is added. Pack the soil around the waste.

4. Make a chart to record daily observations.

5. Discuss different conditions, such as the amount of light exposure or amount of moisture, that might affect the decomposition rate.

6. Helpful hints: For wet landfills, add 2-4 tablespoons of water each day. Keep landfills outside in a sheltered area if possible - they will smell!

Additional activity:

Create compost. Remember to use organic materials when layering. Follow the same procedure as landfill.

G. Organize a Recycling Project

Background:

Teaching youth to be organized and efficient is important. The following youth activity will help make recycling efficient for students, teachers, and custodians.

Objective:

To teach organizational skills and involve youth in the planning of their school and home recycling project. If children participate they will have a vested interest in the program's success. To design a disposal set-up for garbage and recyclables.

Materials:

- Paper
- Pencils
- Ruler

Time:

10 minutes-2 hours. This can be simply a discussion or detailed planning.

Procedure:

Decide which materials you will recycle or check with the recycling coordinator to see what items are being recycled. Have a brainstorming session to find the most efficient way to set up recycling collections. This discussion may center on the classroom, cafeteria, or other offices. You can sketch out your own designs and write reasons why your design will work well. As a homework assignment or project, you can design a system for your home.

Further exploration:

As a homework assignment or project have them design a system for their home.

Let's Get Organized Record

Sketch design of recycling program in school or home, include:

1) Which material will be collected?

1a) What types of containers will be used? Cost of container?

2) Where will the containers be placed?

3) Who will collect recyclables?

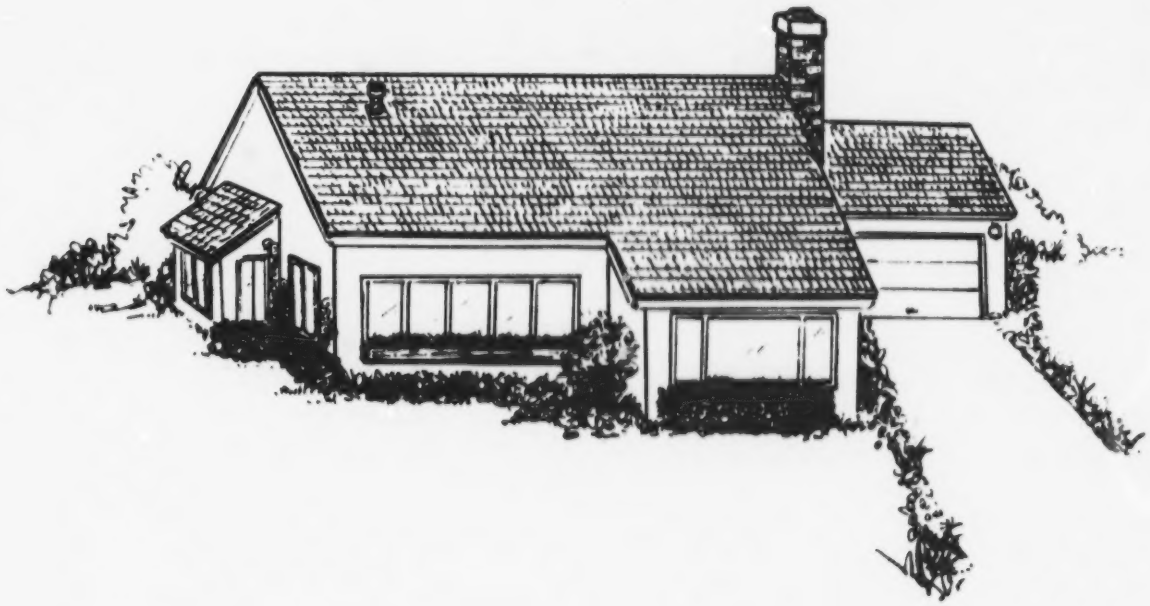
4) How often will they be collected? (if collection occurs one time per week, you will need larger containers than collection that occurs one time per day.)

5) Where in the school are the recyclables stored?

6) How often are they collected from the schools?

** Remember when drawing your diagram it is essential to call the fire inspector to check for fire hazards.*

H. What is This House Made Of?



Activity:

To observe how many resources we use in everyday life.

Background:

Use an object that youth are familiar with to explore how many resources are used to make it. Examples: pencil, house, bicycle, car, softball. You may want to give each student or team a different item to explore.

Objective:

To identify how many natural resources are used to produce an item and why each resource is so important.

Materials:

- Paper
- Pencil

Time:

20 minutes

Procedure:

Take an item that you are familiar with and list all the raw materials needed to produce it.

Example:

House — glass (sand)
wood (trees)
cement (sand, water)
aluminum (bauxite)
electricity (coal)
oil
stone or rock
steel
brick
plastic
water

What is This Made Of Record

Item being examined _____

Parts that make up object	*Raw material needed*	*Renewable in 100 years*	*Can item be recycled?*
i.e. House - Timber	wood	yes	no

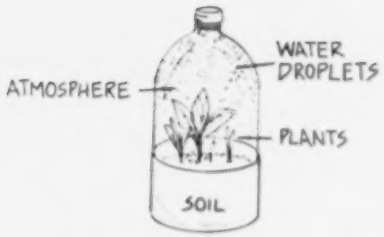
I. Recycled Water?

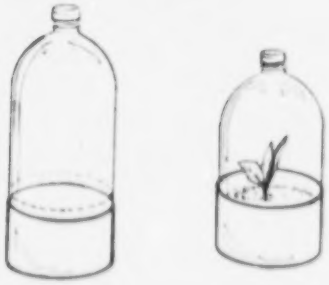
Activity:

Build a terrarium to observe how water is recycled.

Background:

The amount of water on earth is the same today as in the days of the dinosaurs. Everything we do to our water affects its quality. In the exercise that follows we will see how water is recycled. Think about the effects that humans have on this cycle.





Objective:

To investigate how water is recycled in a small environment and learn on a small scale what happens on the earth.

Materials:

- Soil
- Container — 2-liter plastic bottle works best
- 1 or 2 plants depending on size of container
- Gravel or stones
- Water
- Scissors or knife

Procedure:

1. Cut the 2-liter bottle in two pieces at the top of the hard plastic base.

2. Remove the softer plastic from inside the hard plastic bottom if possible.

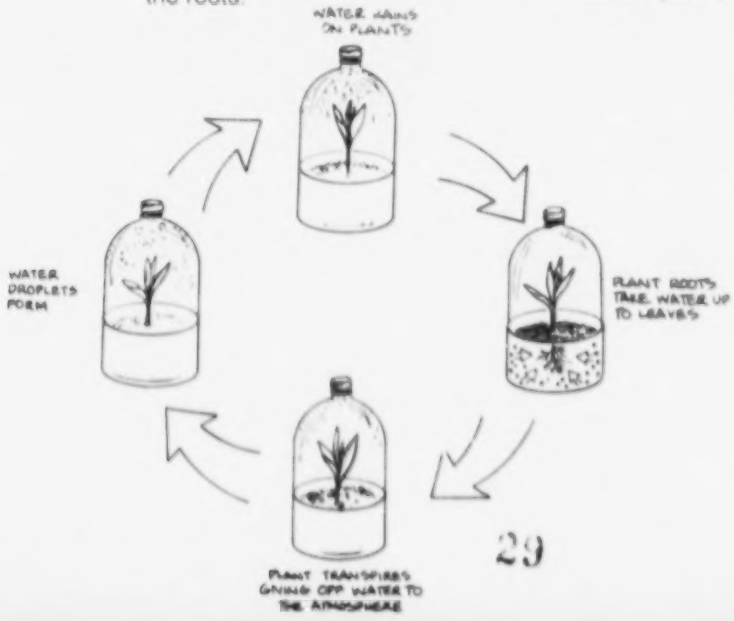
3. Place a layer of stones on the bottom of the clear plastic and add three to four inches of soil.

4. Put the plant in the container, making sure the soil is firm around the roots.

5. Add one to two tablespoons of water depending on how moist the soil is.

6. Place the top of the bottle securely on the base. Keep the cap on the bottle.

7. If the water cycle is working, water droplets called condensation will form inside the dome. When enough condensation forms, it will rain and water the plants.


WATER RAINS ON PLANTS
PLANT ROOTS TAKE WATER UP TO LEAVES
PLANT TRANSPIRES GIVING OFF WATER TO THE ATMOSPHERE
WATER DROPLETS FORM

J. Grow Plants from Trash

Activity:

Growing plants from garbage

Background:

Did you know that some of the things you throw away can be grown into attractive houseplants? All you need is a sunny window, some water or potting soil, flower pots or containers, and a little TLC (tender loving care).

Objective:

To observe how plants recycle themselves

Materials:

- Water
- Potting soil
- Containers for plants
- Seeds, pits, fruit, or vegetable parts
- Newspaper
- Advance preparation
- Read background information

Time:

20 minutes

Plan time into each week for plant maintenance.

Procedure:

1. If possible, take a trip to the grocery store or fruit market (if you want exotic fruits or vegetables go to the larger grocery stores). If the trip is not possible, the instructor will need to shop for produce.

2. Discuss the different types of propagation. (See Plants from Plant Parts, Plants from Seeds, and Plants from Exotic Fruits , which follow.)

ESSENTIAL BACKGROUND INFORMATION

Plants From Plant Parts

— White Potato in Soil:

Take a white potato that is showing "eyes" and cut a section that includes an eye (about 1 square inch). Place it in a pot of moist soil, about 2" deep. Keep the plant moist, but do not "drown" it. Field potatoes are planted this way.

— Sweet Potato in Water:

In the middle of a sweet potato, stick 3-4 toothpicks evenly spaced. Place the potato in a glass of water and put it in a sunny window. Either end can be rooted. Keep the water level high, and after a week or more the potato will usually sprout roots and vinelike stems and leaves.

— Carrot Top in Water:

Cut about 1"-1 1/2" off the top of 4 to 6 carrots. Fill a shallow bowl 2/3 full of washed pebbles (pebbles help support the tops). Place the carrot tops over the pebbles and fill in around them with 1/2" layer of pebbles. Add water to the level of the pebbles and maintain this level at all times. Soon the tops will sprout very pretty foliage.

— Pineapple in Water:

To separate the top from the fruit, hold the fruit firmly with one hand and twist the leafy head with the other. The top should come right off. Remove the lower leaves until the stump is about 1 1/2" long. Put the top in a glass of water and change the water weekly. When roots are 3"-4" long, transplant to a pot.

Plants From Seeds

— Avocado Pits:

Remove the pit from an avocado and allow it to dry for 2-3 days. Peel away as much of the onion-like skin as possible. One-third of the way down, insert four toothpicks at regular intervals. The flat end is the bottom and the pointed end is the top.

Put the pit in a glass of water so that 1/2" of water covers the base of the pit. When the roots are 4" long, transplant it to a pot and keep it in a bright, warm window. Keep the soil evenly moist at all times.

— Mini-Fruit Trees:

Citrus plants can be grown from seeds removed from oranges, grapefruits, lemons, and tangerines. Soak the seeds overnight in water. Plant 1/2" deep in moist potting soil. Cover the pot with a piece of plastic wrap and put in a warm spot. When the seeds start to grow (in a few weeks), remove the plastic. Keep the plant in a warm, sunny window.

— Beans, Peas, and Lentils:

Soak dried beans, peas, or lentils overnight in warm water. Fill a pot 2/3 full with potting soil. Place three seeds on top of the soil and cover with 1/2" of soil. Cover the pot with plastic wrap. After the seeds start to grow, remove the plastic. Put the plant in a warm, sunny window and keep the soil evenly moist. It may be necessary to tie the plants to a small stake as they grow.

— Herbs:

Use anise, caraway, coriander, celery, dill, or fennel seeds. Fill a 6" pot 2/3 full with moist potting soil. Place six seeds on top of the soil and cover with 1/2" of soil. Cover the pot with plastic wrap and place in a warm spot. After the seeds begin to grow (3-8 days), remove the plastic and place the plant in a sunny window. After a few weeks, you will have lovely feathery foliage that can be snipped and used in cooking.

— Peanuts:

Make sure you use fresh, unroasted peanuts. Fill a large, 4" deep plastic bowl 2/3 full with moist potting soil. Shell four peanuts and place them on top of the soil, covering them with 1" of soil. The plants will sprout quickly. In a couple of months small, yellow, pealike flowers will develop along the lower part of the stem. After the flower fades, the ovary swells and starts to grow toward the ground and pushes into the soil. Peanuts will be ready to harvest in about six months.

Plants From Exotic Fruits

(mango, papaya, tamarind, pomegranate)

— Mango:

In the center of the mango, there is a large hairy husk with a pit in it. Scrape off all the excess flesh from the husk and gently pry it open with a dull knife. The pit is best started in a sphagnum bag: fill a Ziploc bag with dampened peat moss or sphagnum. Place the pit in the bag and make sure it is completely surrounded by moss. Check every day to make sure the pit has not dried out or rotted from too much moisture. When the roots are 4" long, transplant to a pot that is at least 1" larger than the pit.

— Papaya:

Papayas are not easy to grow because the plants have a tendency to dampen off (die) at about 6" tall. When you cut the papaya open, you will find hundreds of black seeds surrounded by a gelatinous aril (seed covering). To remove the aril, spread some seeds on a paper towel and roll them with your fingers until the aril squashes off. Plant the seeds immediately in a container with sterile potting soil. Give them bottom heat and high humidity until they pass the critical stage of 6" high. Papayas are rapid growers, and once they are established they will need a lot of water and fertilizer.

— Tamarind:

Tamarind pods look like brown lima beans. The outer shell is brittle and easily peels back, revealing a sticky, brown pulp. Within this pulp there are five or six shiny black pits. Nick the pits (with a nail file) and soak them until they swell, usually in a few hours. Plant the pits in a container with potting soil and place in a sunny window. Tamarinds are water-loving plants and should never be allowed to dry out. As they grow, pinch them back to make the plants fuller.

(SOURCE: "THE PITS," RARE PIT & PLANT COUNCIL)

Plant From Trash Record

Type of plant _____

Did you grow it from spore, seed, or plant parts?

If from a plant part, which one?

Record below the size, color, number of leaves.

	Size	*Color*	*Number of Leaves*	*How often did you water*
week #1				
week #2				
week #1				
week #2				
week #1				
week #2				
week #1				
week #2				

K. Garbage: It's for the Worms

Worms in the house? Yuk! But this composting system actually works! The worms stay in the box and eat household scraps, and the box gives off little odor. Worm composting can be done in apartment buildings or other homes with no yard space. You might try it in your school! Many types of existing containers will work if you do not care to build a worm bin.

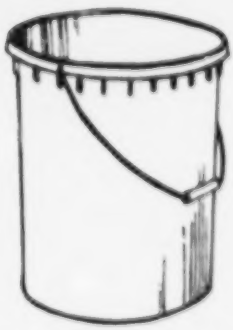
What You Need

Materials:

- container - to build wooden box, see instruction below
- plastic 5 gal bucket with small holes in bottom
- wooden box
- fish tank, 5 or 10 gal
- 1 pound of worms for every 1/2 pound of food wastes produced per day

(Worms sold as fishing bait are best. Red worms are available from Flowerfield Enterprises, 10332 Shaver Road, Kalamazoo, MI 49002, 616-327-0108.)

- Bedding for worms: moistened shredded newspaper or cardboard, peat moss, or brown leaves
- water
- organic wastes



Procedure:

Shred the bedding needed into a mixed bucket. Fill the container to the top with dry bedding (it takes a long time to shred paper.)

Moisten the bedding material for the worms by placing it in a 5-gallon bucket and adding enough water to dampen all the material. Don't worry about getting the bedding material too wet because the excess moisture will drain off when it is placed into the composting container. It is a good idea to put wet bedding material into the bin outdoors and wait until all the water has drained out (one to two hours).

Dig a small hole in the bedding and add your vegetable and fruit scraps. Then cover the hole with bedding. Small amounts of meat scraps can be added in the same way. Do not add any inorganic or potentially hazardous material such as chemicals, glass, metal, or plastic.

Add about 8 inches of moistened bedding to the bottom of one side of the bin. In go the worms! Leave the lid off for a while and the worms will work down into the bedding away from the light.

Keep your compost pile moist, but not wet. If flies are a problem, place more bedding material over the wastes or a sheet of plastic over the bedding, or try placing some flypaper inside the lid. Every three to six months, move the compost to one side of the bin and add new bedding to the empty half. At this time, add food wastes to the new bedding only. Within one month, the worms will crawl over to the new bedding and the finished compost on the "old" side can be harvested. Then add new bedding to the "old" side.

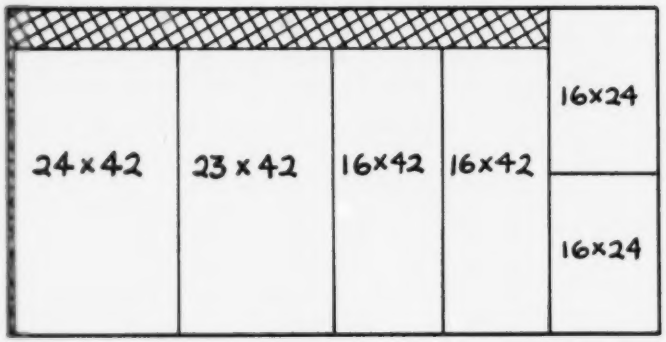
Materials:

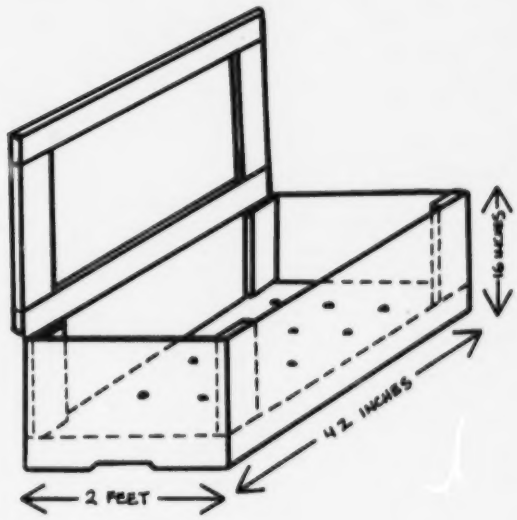
- 1 4-x-8-foot sheet of 1/2-inch exterior plywood
- 1 12-foot length of 2 x 4 lumber
- 1 16-foot length of 2 x 4 lumber
- 1/2 pound of 16d galvanized nails
- 2 pounds of 6d galvanized nails
- 2 galvanized door hinges
- optional: 1 pint of clear varnish or polyurethane
- optional: plastic sheets for placing under and over the bin

Tools:

- tape measure
- skill saw or hand saw
- hammer
- saw horses
- long straight-edge or chalk snap line
- srewdriver
- drill with 1/2-inch bit
- eye and ear protection
- work gloves
- optional: paint brush

Building a Worm Composting Bin





1. Measure and cut the plywood as shown, so you have one 24-x-42-inch top, one 23-x-42-inch base, two 16-x-24-inch ends, and two 16-x-42-inch sides.

2. Cut the 12-foot length of 2 x 4 lumber into five pieces: two 39-inch pieces, two 23-inch pieces, and one 20-inch piece.

3. Lay the five pieces on edge on a flat surface to form a rectangle with the long pieces on the inside and the 20-inch length centered parallel to the ends. Nail the pieces together with two 16d nails at each joint.

4. Nail the 23-x-42 inch piece of plywood onto the frame with 6d nails every 3 inches.

5. Cut four 1-foot lengths from the 16-foot length of 2 x 4 lumber. (Save the remaining 12-foot piece). Take the two 16-x-42-inch pieces of plywood and place a 1-foot length flat against each short end and flush with the top and side edges. Nail the 2 x 4s in place using 6d nails.

6. Set the plywood sides up against the base frame so the bottom edges of the 2 x 4s rest on top of the base frame and the bottom edges of the plywood sides overlap the base frame. Nail the plywood sides to the base frame using 6d nails.

7. To complete the box, nail the 16-x-24-inch pieces of plywood onto the base and sides at each end.

8. To reinforce the box, make sure a nail is staggered at least every 3 inches wherever plywood and 2 x 4s meet.

9. Drill 12 one-inch holes through the plywood bottom of the box for drainage.

10. To build the frame for the lid, cut the remaining 12-foot piece of the 16-foot length of 2 x 4 lumber into two 45-inch pieces and two 20-inch pieces. Lay the pieces flat to form a rectangle, with the short pieces on the inside.

11. Lay the 24-x-42-inch piece of plywood on top of the lid frame so the plywood is 1 1/2 inches inside all the edges of the frame. Nail the plywood onto the frame with 6d nails.

12. Attach the hinges to the inside of the back of the box at each end (on the 2 x 4) and the corresponding undersides of the back edge of the lid frame, so the lid stands upright when opened.

13. The unfinished box should last for at least five years; finishing the box with varnish or polyurethane, however, will protect the wood and prolong the life of the box. Two coats of varnish with a light sanding between coats should be sufficient.

14. Find a good location for the box. It can be placed anywhere as long as the temperature is more than 50°F (10°C). The most productive temperature is 55° to 77°F (13° to 25°C). Garages, basements, and kitchens are all possibilities as well as the outdoors in warm weather (not in direct sunlight). Make sure to place the box where it is convenient for you to use. It is wise to place a plastic sheet under the box.

Reduce, Reuse, and Recycle Around Your Home

Objective:

To discuss the information and encourage students to bring it home to their families.

To send less waste to landfills we must follow these rules: Reduce, Reuse, and Recycle.

To **Reduce**, be a wise consumer: buy in bulk, buy durable goods, and try not to buy overpackaged goods.

To **Reuse**, be creative: buy durable items and use them until they wear out.

To **Recycle**, explore your community's program and participate in it. We can beat the waste crisis by working together and doing our part!

Reduce, reuse, and/or recycle

Newspaper can be recycled or used for craft projects, training house pets, bedding for livestock, washing windows, and making paper mache.

Office paper (white and colored). Set up a paper recycling program in schools and offices to recycle or reuse scrap paper or use for craft projects.

Paper bags. Use to dispose of garbage or as book covers, wrapping paper, lunch bags, scrap paper, paper mache, bring back to store to refill.

Cardboard boxes. Recycle or reused for storage, making posters, playhouses, animal beds, carrying items.

Books and magazines. Recycle when possible or donate to places that need them, such as libraries, and hospitals. Use for craft projects.

Glass bottles. Return all 5-cent deposit bottles or recycle. Glass can be reused as bottles for juice, water, or other liquids. Use widemouthed jars for storing candy, buttons, nails, tackles, food, and other items. Make terrariums. Make lamp bases.

Plastic jugs and bottles. Use as boat bailer, funnel, bird feeder and houses, terrariums, flower pots, containers. Cut off the bottom and use top as a cover for spring plants. Use to make ice packs and cooler ice.

Plastic cups and eating utensils. Wash and reuse until plastic breaks.

Metal cans. Return for 5-cent deposit. Recycle when possible. Reuse larger cans with covers for storage. Decorate covered cans to make pencil holders or cookie cans.

Furniture. Used furniture can be donated to charity or refinished.

Fabric and clothing Use as dust rags, donate to charity, alter clothing to keep up with fashion, or wear for work clothes.

Yard wastes (wood, leaves, grass clippings, garden wastes). If the lawn is cut often enough, clippings should be left because they add nutrients. Yard waste can be put in compost, chipped or shredded and used as mulch; wood scrap can be burned.

Food wastes. Use to supplement animal food or put in compost. (NOTE: do not compost meat, milk, or oil-based scraps.) Grow plants from plant parts and seeds.

Packaging materials (plastic "bubbles" and others). Reuse for packaging. Use in bottom of flower pots or planter boxes for drainage; use in craft projects.

Motor oil. Recycle at service stations that accept used oil.

Batteries. Legislation is proposed to place deposits on batteries. Find out how you can help promote battery recycling. Batteries contain heavy metals that should be kept out of landfills, incinerators, and water supplies. Car batteries should be returned when a new battery is purchased.

Careers Related to Solid Waste

Humans have produced waste throughout existence. By not managing our waste properly, we have created a crisis that will haunt us forever. Below is a list of careers that are related to waste management. Many jobs are and will be available in this field. Explore some of these careers for your future.

Air quality monitor

Business manager

Chemist

Conservationist

Environmental consultant

Environmental engineer

Environmental writer

Equipment mechanic

Geologist

Heavy equipment operator

Hydrogeologist

Hydrologist

Incinerator operator

Junk operator

Landfill operator

Marketing and publicity

Material hauler

Material sorters

Manager and operator of compost facility, material recovery facility, landfill, waste-to-energy facility, recycled material processing plant, or hazardous waste facilities

Manufacturer of related equipment - newspapers, glass, ferrous and non-ferrous metal, all types of paper, plastic, tires, batteries, yard wastes, and oil.

Planner (county, regional, state, federal)

Pollution control professional

Public information specialist

Public works department

Recycling coordinator

Researcher - chemical, biological, market, psychological, waste containment

Safety and medical professional

Salesperson

Solid waste educator

Toxicologist

Water quality specialist

Glossary

biodegradable: capable of being broken down by microorganisms into simple, stable compounds such as carbon dioxide and water. (See "decompose.")

bottle bill: a law requiring deposits on beverage containers, such as aluminum cans and plastic bottles. Encourages recycling and discourages littering and use of landfills.

composting: a waste management process that creates an optimal environment for decomposition by layering organic wastes like food scraps and grass clippings so they will decay into fertile humus.

conservation: the wise use of natural resources to minimize loss and waste.

decompose: to break down into component parts or basic elements; to rot. Decomposition is imperative for the continuation of life since it recycles essential nutrients to make them available for use by plants and animals.

dump: an open, unsanitary disposal site used before the existence of licensed, controlled burial in sanitary landfills.

energy recovery: the generation of energy by burning solid waste.

groundwater: water beneath the earth's surface that fills the spaces and moves between soil particles and rock. It supplies wells and springs.

hazardous waste: a waste that causes special problems for living organisms or the environment because it is poisonous, explosive, burns or dissolves flesh or metal, ignites easily (with or without a flame) or carries disease. Some hazardous wastes cause only one problem; others cause several.

humus: organic material consisting of decayed vegetable matter that provides nutrients for plants and increases the ability of the soil to retain water.

landfill: a site for the controlled burial of solid waste.

leachate: liquid that has percolated through solid waste and/or been generated by solid waste decomposition. It contains extracted, dissolved, or suspended materials. It may contaminate groundwater or surface water.

litter: waste materials discarded in an inappropriate place.

methane: a colorless, odorless, flammable, potentially dangerous gaseous hydrocarbon (CH_4) present in natural gas and formed by the decomposition of organic matter. It can be used as a fuel.

natural resource: a valuable, naturally occurring material such as soil, wood, air, water, or minerals.

nonrenewable resource: a natural resource that, because of its scarcity, the great length of time it takes to form, or its rapid depletion, is considered finite in amount (e.g., coal, copper, petroleum).

organic: derived from living organisms.

pollution: harmful substances deposited in the environment, leading to a state of dirtiness, impurity, or unhealthiness.

raw material: an unprocessed natural resource or product used in manufacturing.

recycle: to collect and reprocess manufactured materials for reuse either in the same form or as part of a different product.

renewable resource: a natural resource derived from an endless or cyclical source (e.g., sun, wind, water, wood, fish). With proper conservation and management these resources will always exist.

reuse: to extend the life of an item by using it again, repairing it, modifying it, or creating new uses for it.

sanitary landfill: a specially engineered site for disposing of solid waste on land. It is constructed in a way that reduces hazards to health and safety.

solid waste: all solid and semisolid wastes, including trash, garbage, yard waste, ashes, industrial waste, swill, demolition and construction waste, and household appliances, furniture, and equipment.

solid waste management: the control, handling, and disposal of all solid waste. One goal of solid waste management is to reduce waste to a minimum.

Cornell Cooperative Extension 4-H Natural Resources Publications

Fisheries and Aquatic Resources

Basic Fly Tying. Available from Media Services. 147L-5-5, $1.65, 19 pages.

Exploring Freshwater Fisheries. Available from Media Services. 147L-5-7, $2.50, 24 pages.

Let's Go Fishing. Available from Media Services. 147L-5-6, $2.00, 33 pages.

Let's Go Ice Fishing. Available from Media Services. 147L-5-15, $1.75, 20 pages.

Sportfishing and Aquatic Resources Education Program (SAREP) Fishing Journal. Available from DNR, $1.00.

Sportfishing and Aquatic Resources Education Program (SAREP) Leader's Manual. Available from DNR, $40.00, 245 pages.

Sportfishing and Aquatic Resources Education Program (SAREP) Member's Manual. Available from DNR, $2.50, 161 pages.

Water Wise: Lessons in Water Resources. Available from DNR, $4.00, 87 pages.

Water Worlds. Available from Media Services. 147L- and M-5-18, $5.35.

Forestry

Backyard Maple Syrup. Available from Media Services. Conservation Corner Leaflet 13, 147CIRL-13, $0.50.

Firewood: From Woodlot to Woodpile. Available from Media Services. 147L-5-12, $2.00.

4-H Wood Sample Collection. Available from Media Services. 147M-5-3A, $0.50.

Know Your Trees. Available from Media Services. 147L-5-3 (Leader's Guide and Checklist), $2.00, 71 pages ; 147J-85 (Member's Project Guide) and 147M-5-3 (Member's Record Book), $0.50.

Nature Trails Development. Available from Media Services. 147L-5-4, $1.00, 24 pages.

Understanding Forest Ecosystems. Available from Media Services. 147L-5-13, $2.25, 42 pages.

Wildlife

Birds in Your Backyard. Available from Media Services. 147L- and 147M-5-17, $5.90.

Birds of Prey. Available from Media Services. 147L-5-9, $3.25, 28 pages.

Bluebirds in New York. Available from DNR, $2.00, 27 pages.

4-H Shooting Sports Notebook. Available from Cornell Cooperative Extension county offices. 204 pages.

Understanding Predation and Northeastern Birds of Prey. Available from Media Services. 147-IB-175, $4.25, 48 pages.

Understanding Wildlife Signs. Slide set. Available from Instructional Materials Services. Set includes 35 slides, with script and cassette.

Wildlife Discovery. Available from Media Services. 147L- and 147M-5-19, $8.25.

Wildlife Habitat Enhancement. Available from Media Services. 147L-5-16, $2.50, 23 pages.

Wildlife in Today's Landscapes. *In press*, will be available from Media Services, June 1990.

Solid Waste

Composting: Wastes to Resources. *In press*, will be available from Media Services, mid-1990.

Recycling in Your School Makes Good Sense. Slide set. Available from Audio Visual Center. Rental price $18, purchase price $42. Set includes 46 slides, cassette, and script.

Recycling: Mining Resources from Trash. *In press*, will be available from Media Services.

What About Waste? *In press.* Will be available from Media Services, late 1990.

Woodsy's Resource Goldmine. Slide set. Available from Audio Visual Center. Rental price $18, purchase price $46. Set includes 52 slides, cassette, and script.

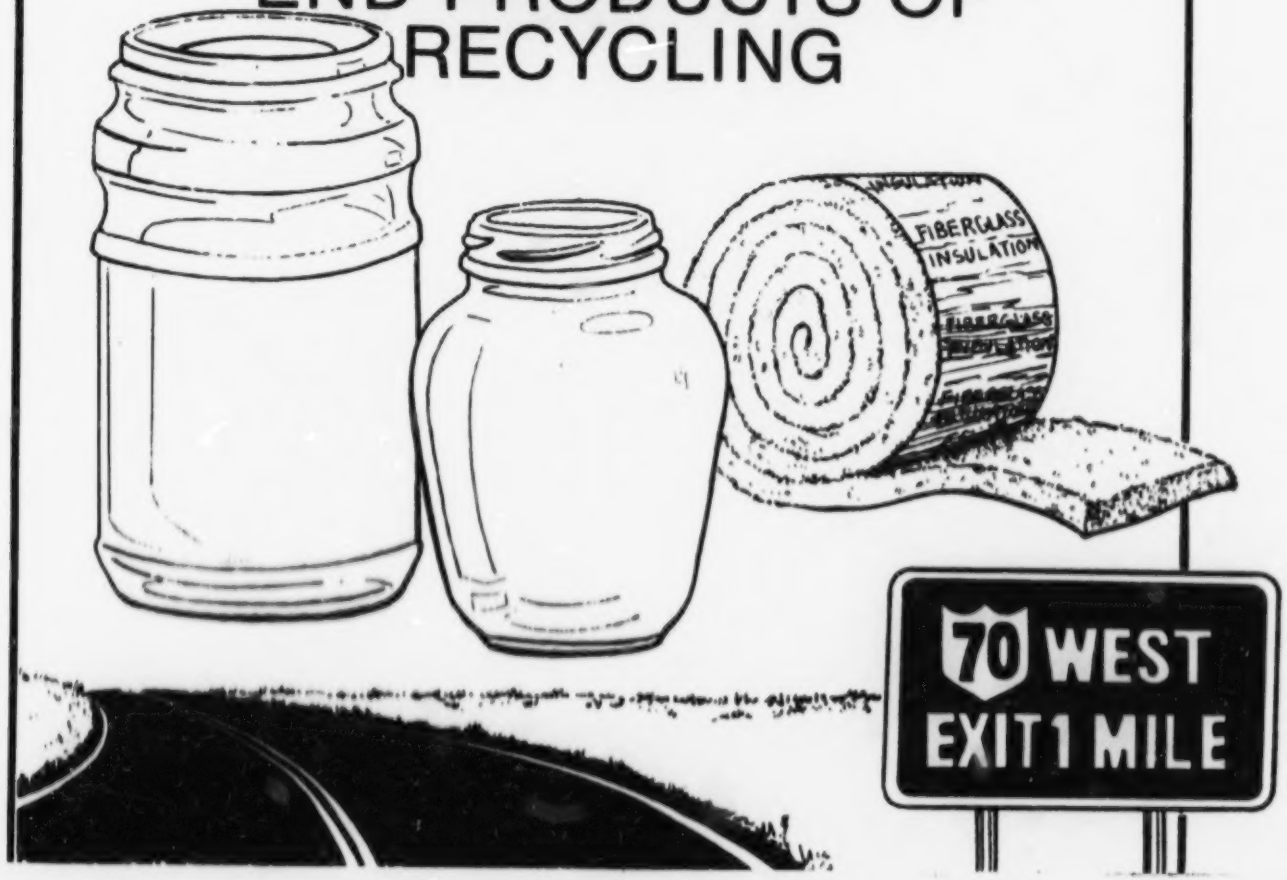
Woodsy's Wastewise. Slide set #303. Available from Audio Visual Center. Rental price $20, purchase price $39.

Other

Renewable Natural Resource-Based Businesses for Enterprising Youth. Available from DNR, $1.10, 22 pages.

GLASS

END PRODUCTS OF RECYCLING



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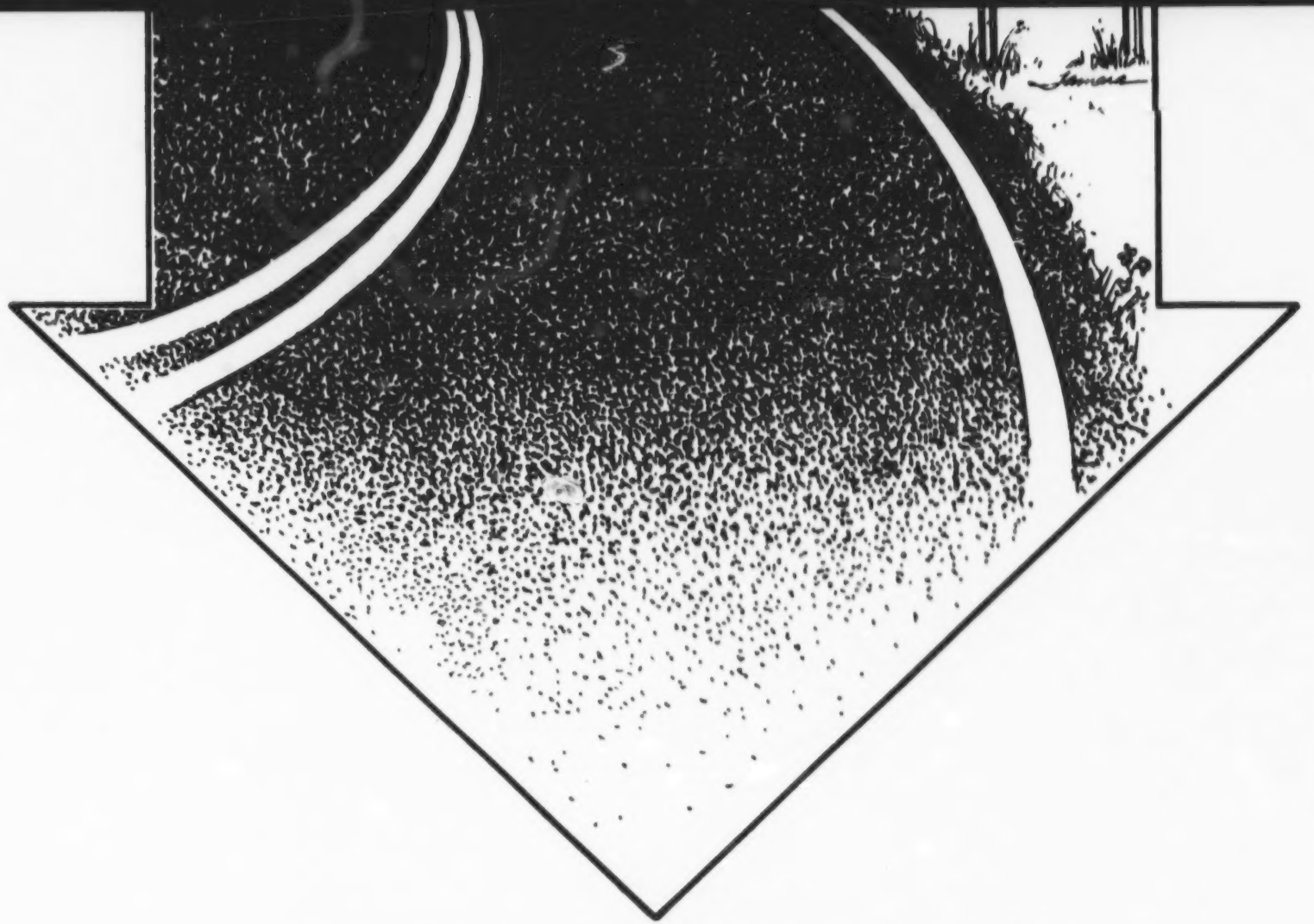

new bottles • mixed with asphalt • brick
tile • fiberglass insulation • reflective paint

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PAPER

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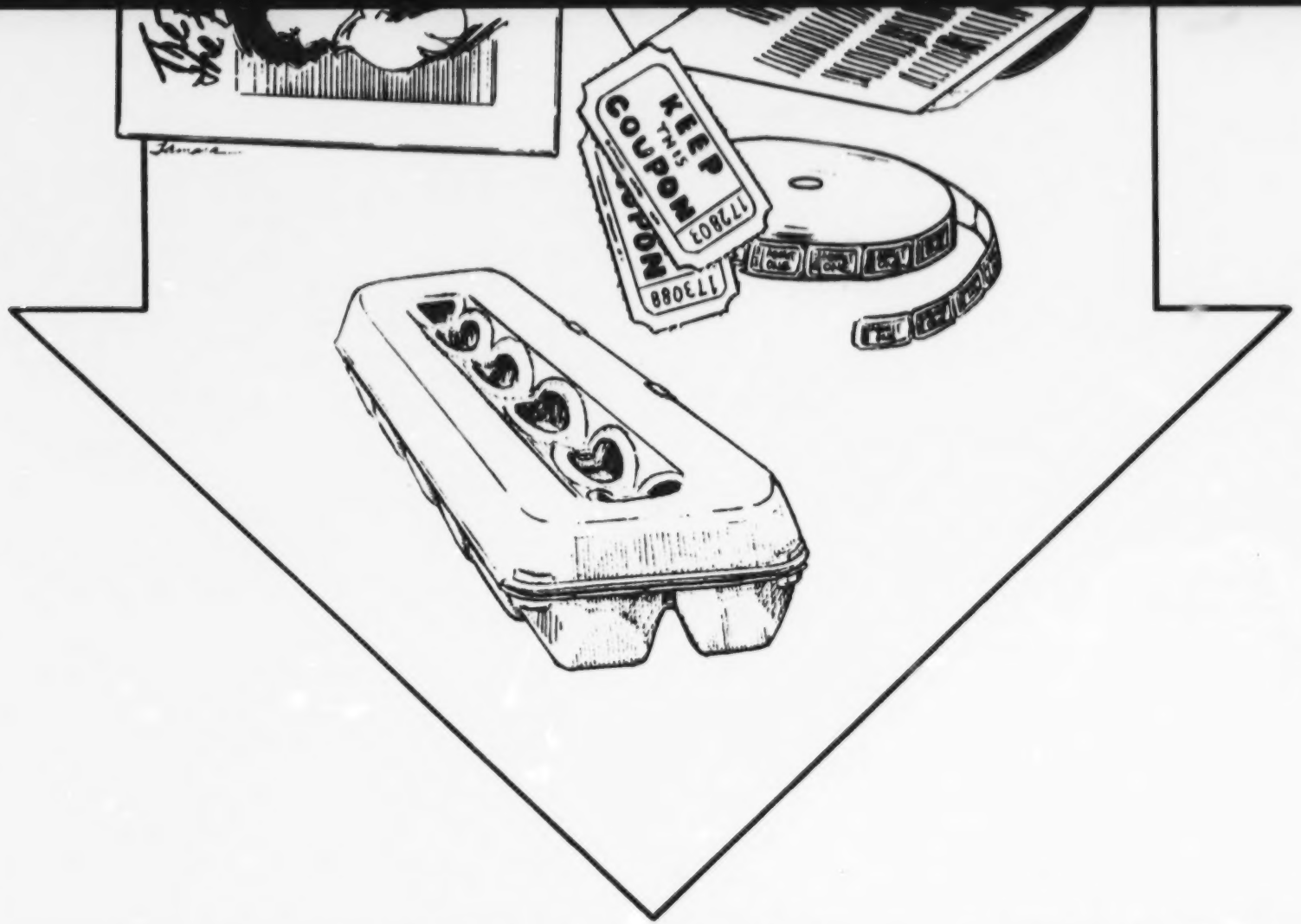

game boards • record jackets • animal bedding • cardboard and puzzles

more paper (all types) • covers for books • food containers • egg cartons

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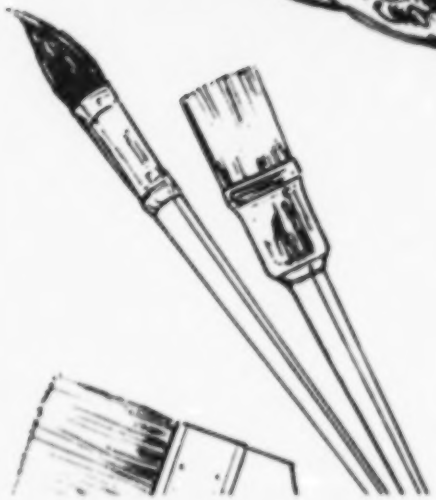
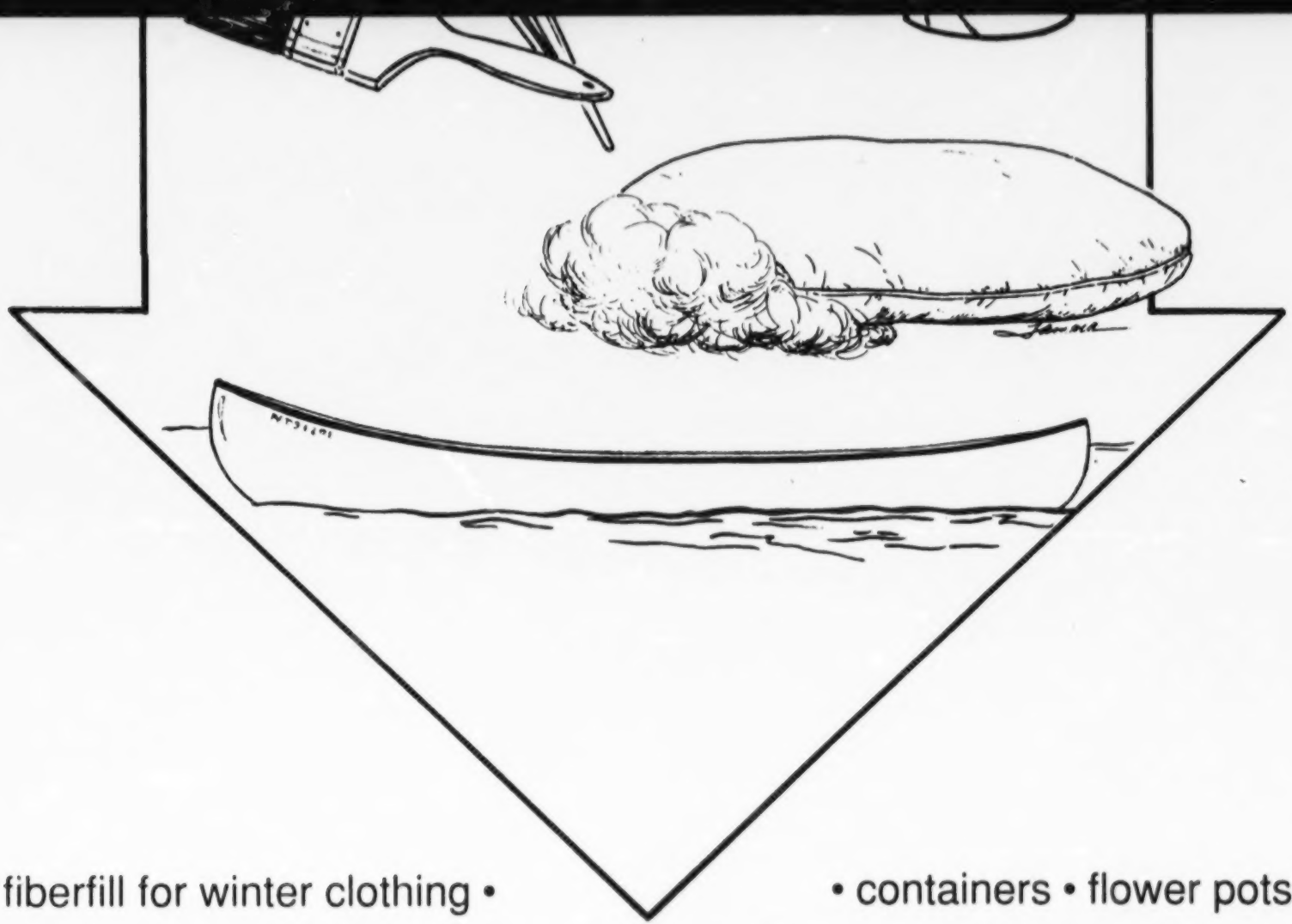
PLASTIC

END PRODUCTS OF RECYCLING





fiberfill for winter clothing • • containers • flower pots
paint brushes • textiles and fibers • appliance cases and handles • boats
building material • park benches and picnic tables • sleeping bags

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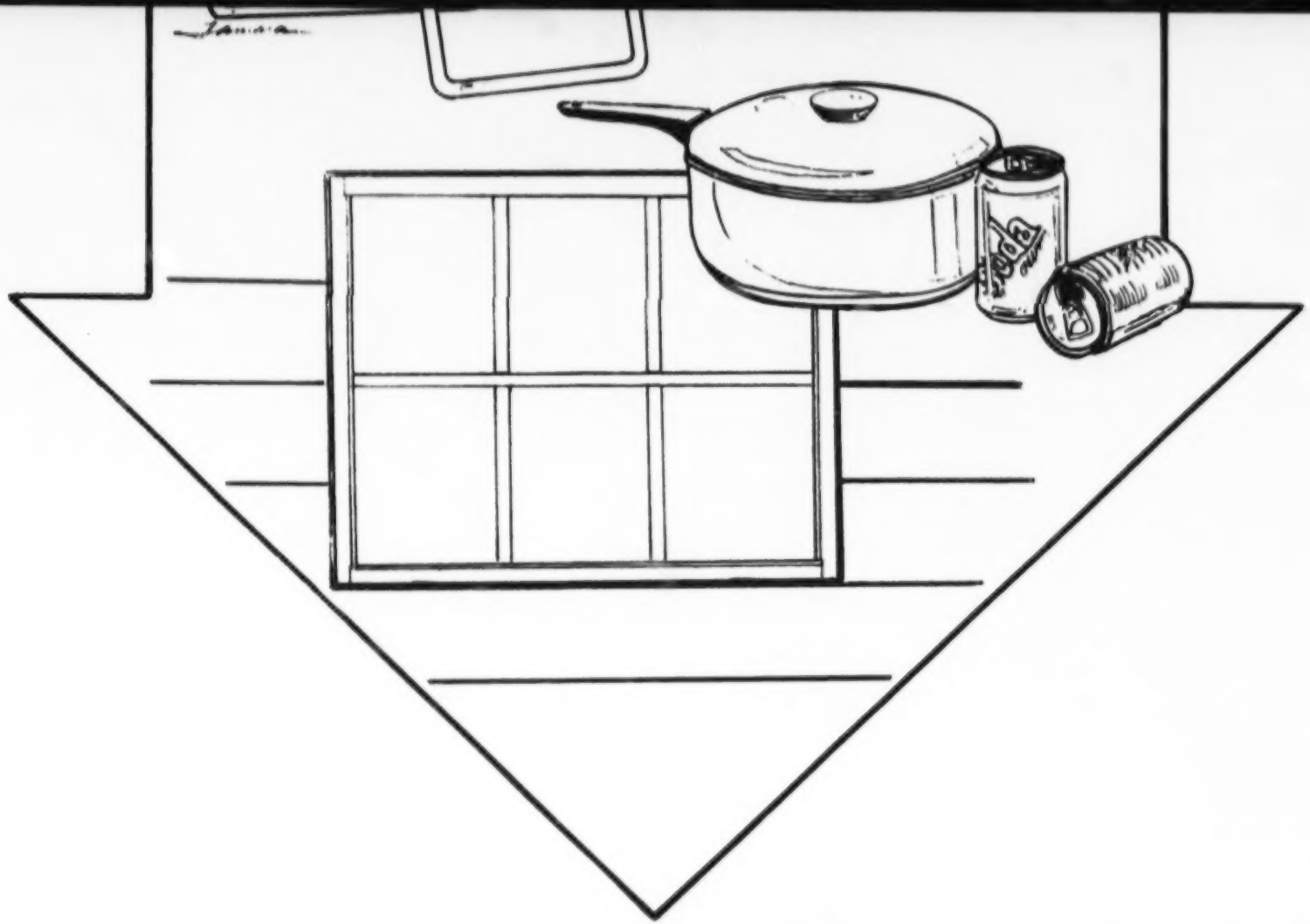
ALUMINUM

END PRODUCTS OF RECYCLING



car parts • printing plates • window frames • pots
lawn chairs • cans • new metal objects • air craft

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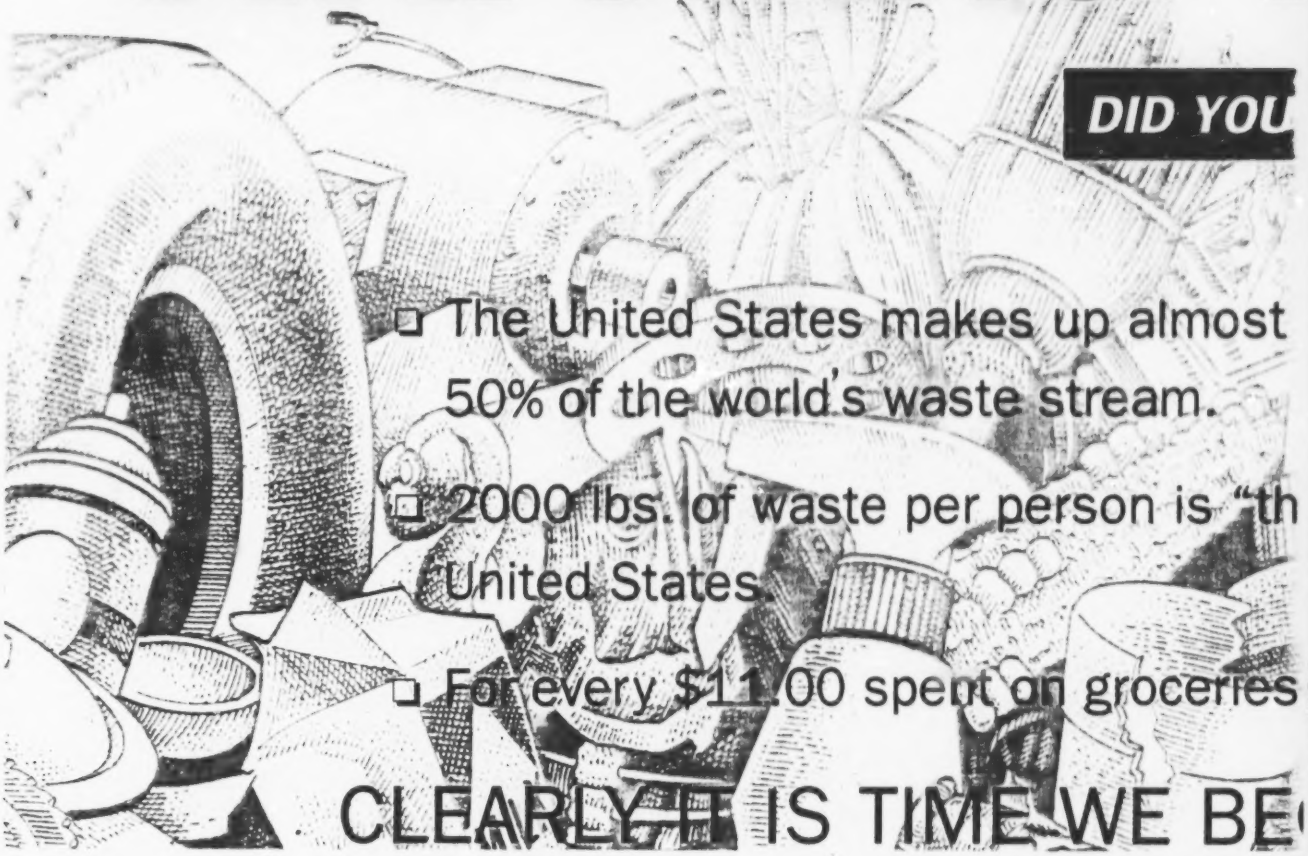
WATCHING Y



DID YOU

- The United States makes up almost 50% of the world's waste stream.
- 2000 lbs. of waste per person is "th United States.
- For every $11.00 spent on groceries

CLEARLY IT IS TIME WE BE

SO, WHAT C

Reduce The Amount

– Don't buy over-packaged or inc
– Do buy durable items instea

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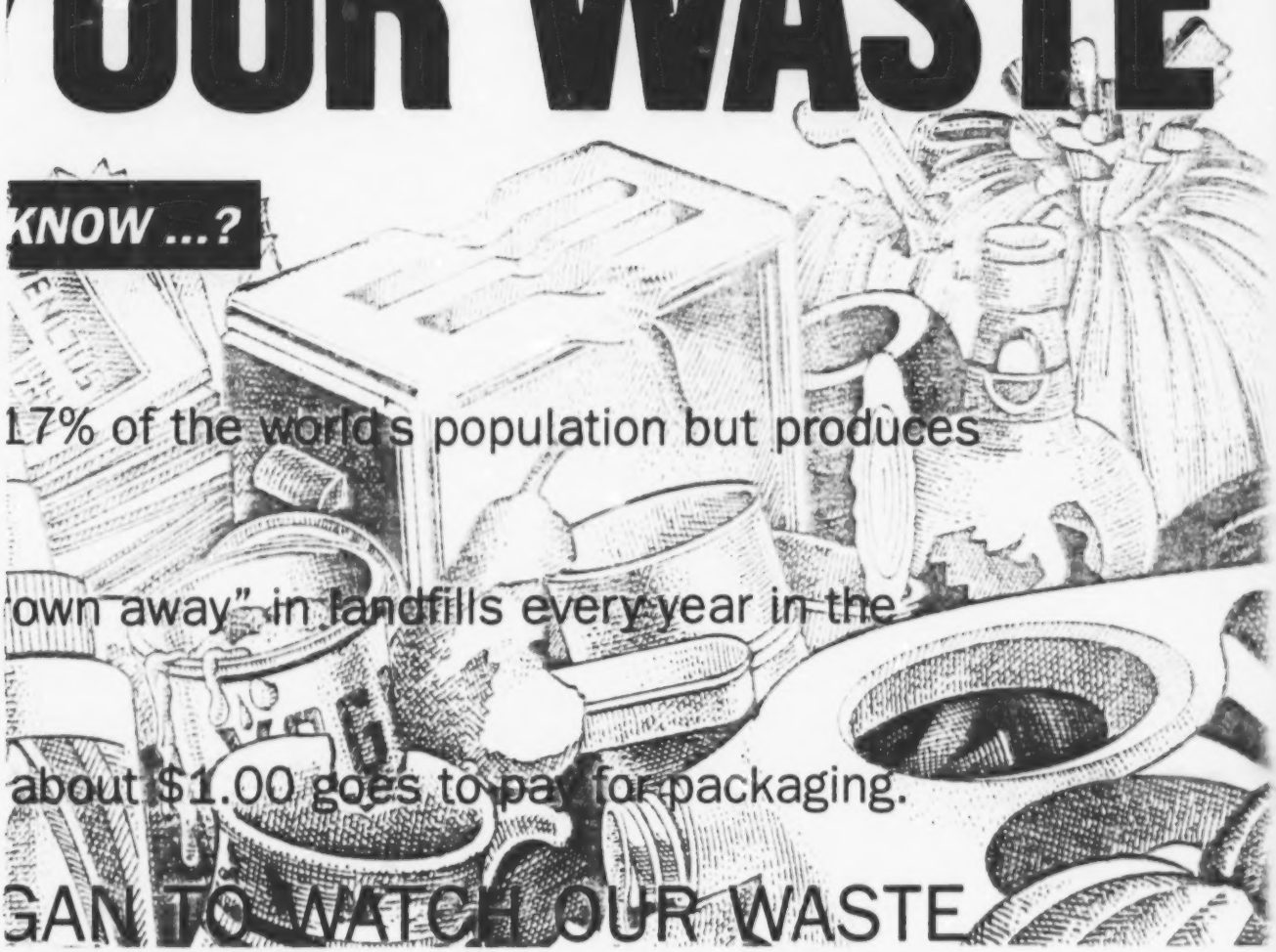
YOUR WASTE



KNOW ...?

17% of the world's population but produces

"own away" in landfills every year in the

about $1.00 goes to pay for packaging.

GAN TO WATCH OUR WASTE

AN YOU DO?

of Waste You Produce

lividually wrapped items.

d of disposable items. i.e. razors.

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pens, pencils, containers.

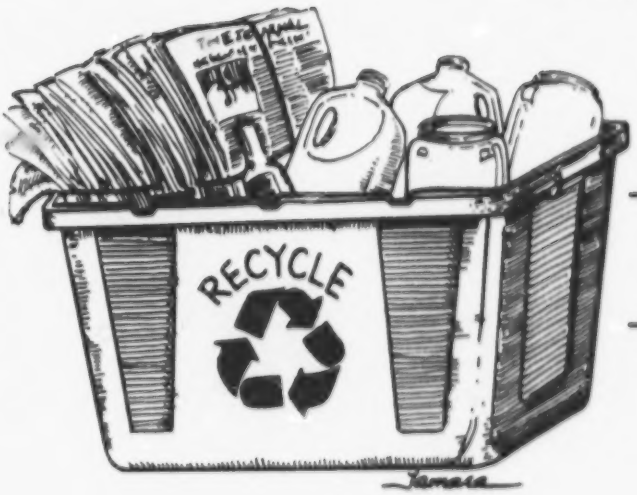
– Do be conscious of buying

Re

– Reuse

– Reuse paper to pack item
messy jobs, for craft proje

– Donate old books, clothes,
will, thrift, or book stores.



Recycle As Mu

– Separate glass, newsp
out of your waste strea

– Compost organic wast

Get Other

– Start recycling in y

– Remind your family of the thre

– Most importantly, S

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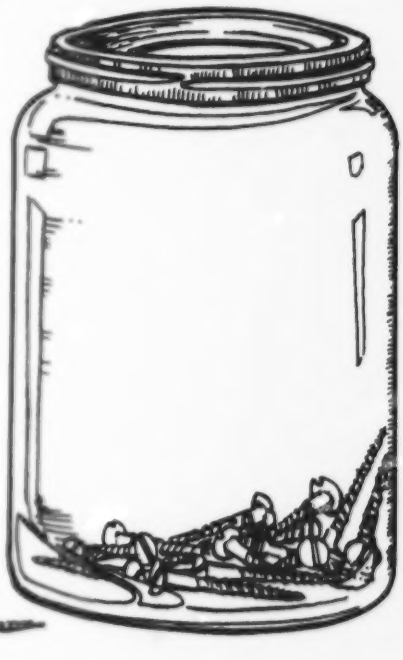
Produced by: Anne Ge
Top Illustration from Al

recycled and recyclable products.



ıse

bags and containers for storage.

. to be mailed, as drop-cloths for
:ts, or for scrap.

urniture, and appliances to good

ch As You Can

aper, paper, aluminium and scrap metals
m and recycle them.

, soil needs recycling too.

s Involved

our school and home.

R's: reduce, reuse and recycle.

ET A GOOD EXAMPLE!

yced Paper

lin High School Intern
y County LRRP Grant

CORNELL
WASTE MANAGEMENT
INSTITUTE
174RMTWW